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PRICING STRATEGY, PRICING STABILITY AND
FINANCIAL CONDITION IN THE DEFENSE
AEROSPACE INDUSTRY

by

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and
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June 1987

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Two separate issues are addressed. The first issue concerns the relationship between financial condition and contractor pricing strategy. The second concerns the relationship between organizational slack and pricing stability.

The overall findings are:

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19. ABSTRACT (CONTINUED)

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2. That no apparent relationship exists between organizational slack and pricing stability.

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Pricing Strategy, Pricing Stability and Financial Condition
in the Defense Aerospace Industry

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3

ABSTRACT

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Two separate issues are addressed. The first issue concerns the relationship between financial condition and contractor pricing strategy. The second concerns the relationship between organizational slack and pricing stability.

The overall findings are:

1) That a limited amount of variation in pricing strategy can be explained through the use of a linear regression model using financial ratios. and

2) That no apparent relationship exists between organizational slack and pricing stability. (losses).

TABLE OF CONTENTS

6

I. INTRODUCTION

A. BACKGROUND

Acquiring major weapon systems is a complex and challenging process, one that has been subjected to considerable study over several decades. Criticisms of the process in the Department of Defense have focused on the acquisitions taking too long, costing too much, and resulting in operational systems that do not perform as expected. [Ref. 1:p. 1]

In addition, major acquisitions are under the watchful eye of Congress and the American public, subject to the strict regulations and procedures, and are of such a high dollar value that they have become highly political between the government and prospective contractors.

Contracting is big business. On an annual basis an average of 900 contracts of all sizes, nearly three for every day of the year, is handled by each of the DOD's 13,000 contracting officers. Everything from light bulbs to multi-million dollar jet fighters are purchased through these contracts. [Ref. 2:p. 50] The acquisition process is growing by leaps and bounds but has been racked by procurement scandals in recent years due to overpriced ashtrays, gold-plated hammers and elaborate sofas. These scandals have made procurement everyone's business and vaulted the DOD contracting process to the front page.

The defense procurement market is not classically competitive because of its monopsonistic buyer, DOD, and its oligopolistic prime contractors. In some cases sole source procurements have led to the creation of a

monopolistic seller and bilateral monopoly market structure. [Ref. 3:p. 7]

The absence of competition or the Pentagon's self-exemption from market forces, according to former Navy Secretary John Lehman,

> . . . is at the root of many of our procurement ills. The bureaucrat finds the environment comfortable because nobody gets in trouble or fails. Defense contractors make a return on equity double that of non-defense companies. Only the taxpayer and the man in uniform who has to use the weapons suffer. [Ref. 4:p. 99]

The Competition in Contracting Act of 1984 (CICA) and budgetary constraints have led to greater direct competition by seeking to establish full and open competition in the sealed bid and competitive negotiation process. National fiscal constraints create indirect competition through alternative uses of funds, guns or butter, and indirect competition exists from alternative weapon systems or strategic application with their proposed new weapon system. However, the unique, innovative and limited use products created in the defense market will continue to move away from classical competition and its disciplined market. [Ref. 3:p. 7]

B. OBJECTIVE

This research investigates two issues related to major weapon system acquisition in the defense aerospace industry.

The objective of this research is to perform an analysis into the presence of associations between a corporation's financial condition and the corporation's pricing strategy

8

and pricing stability. In order to determine if such associations exist, relationships between various financial ratios and measures designed to reflect pricing strategy and pricing stability are analyzed utilizing various statistical procedures.

C. RESEARCH QUESTIONS

Does an identifiable relationship exist between a corporation's financial condition and the corporation's pricing strategy and pricing stability in the DOD aerospace industry?

Subsidiary questions also asked include the following:

(1) A. What is financial condition?

B. What are the elements of financial condition and what measures reflect these elements?

(2) A. How can pricing strategy be defined and measured?

B. Is pricing strategy related to financial condition?

(3) A. How can pricing stability be defined and measured?

B. What is the relationship between financial measures and pricing stability?

D. SUMMARY OF THE STUDY

The purpose of this research was to determine if pricing strategy and pricing stability for products in the defense aerospace industry could be predicted based on a firm's financial condition. The sample population for this

research included 17 contractors and 52 aircraft and missile programs.

Two separate but related issues were addressed. The first issue concerned the relationship between financial condition and contractor pricing strategy. Two pricing strategies were identified: skimming and penetration. Slopes of price reduction curves were used to reflect pricing strategy. Various financial ratios were used to reflect aspects of financial condition. Eighteen ratios were developed from corporate financial reports for the year of initial product delivery and for the five years preceding that delivery. These ratios were correlated with the slopes of price reduction curves for the programs in order to test the relationship between financial condition and pricing strategy. The relationship was further analyzed through the use of stepwise and heuristically selected linear regression models. The overall findings were that a limited amount of the price reduction curve could be explained by a linear regression model.

The second issue concerned the relationship between organizational slack and pricing stability. Measures of organizational slack were determined from financial data for each contracting firm for the six years prior to and including the year the delivery of the first weapons system unit by the contractor. R-squared values for learning curves fit to price data were used to reflect price

stability. Correlation analysis was used to test for association between the slack measures and the R-squared value for the price curve. This analysis uses both correlation and regression methods. No useful model was developed to relate pricing stability with organizational slack.

E. ORGANIZATION OF STUDY

Chapter II discusses background and conceptual foundations. The theory and concepts underlying financial condition, pricing strategy, pricing stability and organizational slack are presented. The major hypothesis of the study is stated.

Chapter III describes the sample used in the analysis and data collection procedures.

Chapter IV describes the analysis of the relationship between financial condition and pricing strategy. Results from univariate correlation tests, stepwise regression models, and heuristically developed standard regression models are described and presented.

Chapter V describes the analysis of the relationship between financial measures of organizational slack and pricing stability. Results from statistical procedures, primarily correlation analysis, are described and presented

Chapter VI provides the conclusions of research and recommendations for further study.

II. BACKGROUND AND CONCEPTS

The Department of Defense Policy on purchasing goods and services is to rely on commercial market prices or competition whenever feasible. The department buys a large number of goods and services which are readily available in the commercial markets. . . . DOD is also faced with the problem of purchasing a great number of highly expensive, technologically complex, militarily unique items for which there is no effective market mechanism to set the price and where it is economically impractical to obtain competition. [Ref. 5:p. 1]

Items in this category include advanced fighter aircraft, surface to surface missiles and air to air missiles--weapons systems which will be considered in this study. Items which are unique to the military as compared to commercial items contain these characteristics:

technologically complex

expensive

produced in relatively low volume

highly reliable and maintainable

lengthy development

produced in a regulated market. [Ref. 5:p. 1]

In order to better understand the DOD pricing and acquisition process, the following phases of the acquisition cycle are summarized here:

- Concept exploration: both DOD and industry devote substantial resources and time in this phase to advance the edge of technology. Industry shares this view but primarily to keep an edge on its competitors.

- Demonstration/validation: the decision to begin development of a new aircraft or missile system begins

12

in this phase. There is generally a mixture of DOD and company resources devoted to the work performed to demonstrate the feasibility of proceeding further into the next phase.

- Full scale engineering development: this phase involves the development of detailed specifications for entering into the production phase. Depending on the system there may or may not be competition in this phase.

- Production: the production phase begins when full scale development is complete and testing has demonstrated that the system will perform as required. In recent years, there has been less prime contractor competition during this phase.

- Deployment: this is the final phase of the acquisition process and extends well beyond the completion of production. During this phase, DOD looks for the system developer to provide initial support, but strives to develop a second source to enhance competition for each respective program. [Ref. 5:p. 3]

In recent years, DOD and the military have gone to great lengths to improve the acquisition process. Specifically, the 1981 acquisition improvement program is perhaps the most comprehensive approach to improve the ability to acquire weapon systems in a more cost effective and efficient manner. [Ref. 5:p. 18]

Two of those elements which are stressed in the acquisitions improvement program are:

improved cost estimating;

improved program stability. [Ref. 5:p. 19]

This thesis investigates issues related to each of these two elements. To the extent that contractor pricing strategy can be detected, improved cost prediction may result. To the extent that factors affecting price stability can be identified, issues related to program stability may be better understood. This chapter further

addresses these two elements within the following four sections.

    A. Financial Condition

    B. Pricing Strategy

    C. Pricing Stability

    D. Hypotheses

A. FINANCIAL CONDITION

The financial condition of a firm is most often described through the use of various financial ratios. The data required to construct these ratios can be found in the annual reports of publicly traded companies. These reports generally consist of a balance sheet, an income statement and a statement of changes in financial position.

The balance sheet presents information regarding the firm's assets, liabilities and stockholder's equity. The income statement provides information with respect to operations, including revenues, expenses, and various measures of income, etc. Finally, the statement of changes in financial position presents information on the flow of funds within the firm. This includes how the firm has obtained funds and how the firm has made use of its funds.

The raw data provided in these documents may give an analyst a general feeling for how a given firm may be performing. The firm's financial condition, however, can best be described and quantified through the use of financial ratios commonly used in financial analysis.

1. **Financial Ratios**

It is possible to calculate a nearly limitless number of different financial ratios given the information provided in the reports of most sizable, publicly traded companies. Five categories of ratios will be included in this study:

1. Profitability
2. Short Term Liability
3. Solvency
4. Asset Acquisition
5. Capital Investment.

2. **Profitability**

Profitability ratios enable an analyst to measure a firm's ability to earn an adequate return on investment, including assets and shareholder equity. The concept of profitability may also be a driving force in determining Pricing Strategy, a subject that will be discussed later in this chapter. The following are some common examples of profitability ratios.

1. Profit margin = net income/sales
2. Return on assets = net income/total assets
3. Return on equity = net income/shareholder's equity.

Profit margin should give the analyst information as to cost control when compared to industry averages. Return on assets will give an indication as to how well those assets are being used with respect to other firms in the

same industry. Return on equity shows how well shareholders are being compensated for the risk they have taken in buying stock in the given firm. [Ref. 8:pp. 51-80]

There are other variants of these ratios that can be used in the evaluation of a company's profitability. They all aid in determining how well the firm is earning profit given a certain amount of investment and sales activity.

3. Short Term Liquidity

Short term liquidity is generally described through the use of two ratios. These are the Current Ratio and the Quick Ratio. They are presented below.

1. Current Ratio = current assets/current liabilities

2. Quick Ratio = (current assets-inventory)/current liabilities

These both illustrate a company's ability to pay off short term debt and other short term obligations. They also provide some indication of a firm's flexibility, its ability to respond rapidly to new opportunities, or changes in conditions. Short term liquidity reflects short run risk.

4. Solvency

Solvency, or capital structure, is a measure of long term risk. It shows the amount of and the type of debt in a company's capital structure. This can be a good indicator of the company's long term ability to meet obligations. [Ref. 7:p. 5] The following are examples of solvency ratios:

1. Debt ratio – total liabilities/total assets

2. Times interest earned – Income before interest & tax/interest

The debt ratio shows how prudent a company is in its decisions to take on debt. Times Interest Earned is an indicator of a company's ability to pay the interest on outstanding debt.

5. **Asset Utilization**

Asset utilization ratios help illustrate how efficiently a firm uses its assets. Two useful examples are:

1. Inventory turnover = sales/inventory

2. Total asset turnover = sales/total assets.

Inventory turnover is an indicator of how well sales are being generated per dollar of inventory. In a similar fashion, total asset turnover shows the degree to which sales are generated per dollar of total assets. Both ratios relate existing investment in assets to the level or volume of activity (sales) supported by that investment.

6. **Capital Investment**

Finally, capital investment ratios give an indication of how well a company is updating its industrial/manufacturing facilities. These ratios are represented by the following examples:

1. Investment to assets = new investment/total assets

2. Investment to plant = new investment/total plant & equipment

Generally, capital investment ratios relate to the amount of new investment in productive capacity (plant and equipment) to existing assets (or other measures of firm size).

7. Ratios to be Used in this Research

This study will make use of the ratios listed in Table 1 below.

The ratios contained in Table 1 were chosen with specific considerations in mind. First, in the cases of several of these, they were used in previous similar studies and showed some promise. [Refs. 7:p. 19; 3:pp. 33-34] Next, the items used in each of the ratios had to be identifiable from the financial statements used in obtaining the data. Finally, we attempted to use a diverse grouping of ratios so as to minimize redundancy. We did use available data to calculate one piece of information not available on most financial statements reviewed. Our investment figure for new plant and equipment was calculated according to the following formula:

Investment in New Plant & Equipment (INPE) = Plant & Equip. (t) - Plant & Equip. (t-1) + Depreciation (t)

where:

t = period for which INPE is being calculated

t-1 = period immediately preceding t.

We did this because no investment figures were available on most of the financial statements used as data sources.

18

TABLE 1

FINANCIAL RATIOS

Profitability

Profit Margin = net income/sales

Return on Assets = net inc./total assets

Return on Equity = net inc./stockholders equity

Short Term Liquidity

Current Ratio = current assets/current liabilities

Quick Ratio = (current assets-inv.)/current liabilities

Current Asset Ratio = current assets/total assets

Receivables Turnover = sales/accts. receivable

Solvency

Debt Ratio = total liabilities/total assets

Current Debt Ratio = current liabs./total assets

Non-current Debt Ratio = Non-current Liabilities/total
assets

Interest Coverage = operating income/interest expense

Asset Utilization

Total Asset Turnover = sales/total assets

Plant Asset Turnover = sales/plant & equipment

Inventory Turnover = sales/inventory

Capital Investment

Investment to Assets = investment/total assets

Investment to Plant = investment/Plant & Equipment

Investment to sales = investment/sales

Investment to Funds = investment/(net inc.+depreciation)

[Refs. 7:p. 19; 6:pp. 51-80]

In concluding this section on financial condition, it should be emphasized that while financial condition of a firm can be analyzed through the use of ratios, financial ratios should be analyzed over a reasonable period of time in order to avoid using data from a single "off year" that

might represent a company inaccurately. It is generally recognized that trends in data can frequently be more valuable to the analyst than the isolated data of a single reporting period.

B. PRICING STRATEGY

There are basically two pricing strategies used by companies (e.g., defense contractors) when bidding for a manufacturing contract. These strategies are known as:

1. Price Skimming

2. Penetration Pricing. [Ref. 8:pp. 76-77]

Price Skimming describes a situation where a company charges a relatively high price for initial production units and then reduces prices in a step-wise fashion over time. [Ref. 9:p. 7] Penetration Pricing, on the other hand, describes a situation where a company initially sets prices low in order to capture a large segment of the market share. Here, the producer intends to achieve economies of scale. Future profit is based on the learning curve theory. This theory, in short, predicts that improved labor output and more efficient equipment use can be achieved over the life of a production run. [Ref. 9:p. 6]

1. Price Skimming

There are four reasons for a manufacturer to use a price skimming strategy.

1. A new product is less likely to meet any competition when initially produced. Therefore, it may not be particularly risky to start out at a high price.

20

2. The initial high price allows the manufacturer to "skim the cream" of the market. This generally occurs before the buyer (e.g., the U.S. Government) demands a price reduction or before the manufacturer expands market share by reducing the price.

3. The skimming strategy also appears to be the safer of the two routes to follow. By skimming, the manufacturer/seller gets a quick return on investment and rapidly recovers initial development and set-up costs.

4. The high price initially obtained for the good often results in the in-flow of funds to the producer in quantities sufficient to finance the expansion of manufacturing facilities. [Ref. 10:pp. 174-175]

2. Penetration Pricing

There are also several reasons to use penetration pricing. These are:

1. When the volume of sales is sensitive to price, then it may be more profitable to follow the penetration strategy.

2. When economies of scale can be achieved quickly and large volumes can be sold on the market, then the penetration strategy is probably appropriate.

3. Penetration pricing is appropriate when competition is a threat from the very beginning.

4. When there are no buyers at the initial price, then the seller must reduce prices and lean towards a penetration strategy. [Ref. 10:p. 175]

3. Discussion of Both Strategies

The aforementioned reasons dealt with market issues. There are other possible reasons to use one strategy or the other, as each seems suited for firms in specific financial environments. It is necessary to discuss pricing strategy in the context of the aspects of financial condition.

According to Moses [Ref. 7], profitability is not inherently greater under either pricing strategy. Price skimming does, however, provide for higher profits immediately after initial production than does penetration pricing. Moses contends that since executives are generally compensated on the basis of profit, these same executives might prefer the skimming strategy in order to enhance their own personal wealth. Penetration pricing may increase the probability that the average return on investment will decline with the introduction of the new product. For firms with high profitability, that return will decline even more precipitously. Therefore, Moses hypothesizes that firms with high profitability may prefer a skimming strategy.

Short term liquidity can certainly be affected by the introduction of new products. Skimming is probably the appropriate strategy for firms lacking short term funds. This is due to the faster payback offered through skimming. [Refs. 10:p. 174; 11:pp. 526-528] Since firms with short term liquidity problems have more difficulty in generating funds, they are more likely to attempt to generate funds through their products with a skimming strategy. [Ref. 7:p. 5]

Solvency is a reflection of a firm's long term debt structure and, therefore, its long term risk. Dean (1969) proposed that skimming allows the firm to reduce future risk by taking in maximum profits as soon as possible. This

22

does, however, reduce the possibility for penetration pricing and the resulting control of market share. In general, it can be expected that firms with poor solvency measures may prefer to use the skimming strategy. [Ref. 7:p. 5]

Asset utilization measures can also give some indication of a company's pricing strategy. Firms producing at or near capacity may prefer to use price skimming. On the other hand, a firm that is not using its manufacturing capacity may prefer the penetration approach as this would provide for an increased use of capacity. It might, therefore, be expected that companies with low asset utilization ratios may prefer penetration pricing. [Ref. 7:p. 6]

Capital investment ratios may indicate a firm's future strategy. A company that makes major new investments in plant and equipment might be expected to be a price penetrator in order to increase the probability that the new investment will be sufficiently utilized. Conversely, a company that does not make these investments would probably be interested in a skimming strategy.

4. Learning Curves

Learning curves have been derived from the observation of production cost data in various industries. These curves first came into use in the aircraft industry during World War II. The learning curve was used by T.P.

Wright to accurately predict delivery schedules for aircraft. He did this by observing that production time for a given aircraft shortened as the number of aircraft produced increased. He found that this was due to increased worker expertise and experience.

Learning curves are discussed here because they will be used to operationalize the concept of pricing strategy. This research will attempt to find a relationship between the slopes of price reduction curves (i.e., learning curves) and a company's financial condition. The two pricing strategies can be characterized by first unit price and the degree of price reduction over time. A skimming strategy typically involves a relatively high initial price coupled with a relatively steep reduction in price over the life of the project or product. In contrast, the penetration strategy involves a relatively low initial price with little or no price reduction over time. The degree of price reduction can be captured by the slope of a learning curve fit to price data.

According to Liao [Ref. 13], there are two different concepts of the learning curve. These are the Cumulative Average Cost Concept and the Incremental Unit Cost Concept.

5. Cumulative Average Cost Curves

Cumulative average cost curves are determined through the use of the power function:

$$C(Q) = AQ^B$$

where:

    C(Q) = cumulative average cost for quantity Q

      Q = cumulative quantity

      A = the cost of the first unit produced

      B = the slope of the curve.

The value B can be found through the use of the formula:

$$B = \ln S/\ln 2$$

where:

    S = the percentage reduction in cumulative average
       costs as quantity is doubled

B is usually determined through regression analysis. [Ref. 14]

    The idea here is that as production quantity is doubled, the average cost of cumulative production is reduced to:

    S x (100%) x (the cost of the previous level).

For example, a learning curve with a 0.80 slope (80%) will show that as production quantity doubles, the newest doubling of the production level costs only 80 percent of the previous level. Table 2 illustrates a hypothetical production line.

6. Incremental Unit Cost Concept

Unit cost curves are determined in the same way that cumulative curves are, with the exception that different values are used. Unit cost learning curves take the form:

TABLE 2

HYPOTHETICAL PRODUCTION LINE

Production Lot	Cumulative Quantity	Cumulative Costs Total	Per Unit
1	1	$100	$100
2	2	$160	$ 80
3	4	$256	$ 64
4	8	$409.6	$ 51.2

$$C = AX^B$$

where:

C = cost of unit X

X = unit number

B = slope of the curve = ln S/ln 2

A = cost of first unit.

Since we assume that learning is a continuous process, the cost of each unit should be less than the one that immediately preceded it, as less labor input is necessary.

As we are dealing with lots of aircraft, it should be noted that the average cost of the lot is equal to the cost of one production unit within that lot. In order to derive a learning curve, we use the following formula to estimate the midpoint:

$$\text{Lot Midpoint (i)} = \left[\frac{\sum\limits_{x=n+1}^{n+Q_i} x^B}{Q_i} \right]^{1/B}$$

where:

    n = cumulative quantity produced to time i

    B = learning curve exponent (learning rate factor).

Considering the above equation, it is clear that the lot midpoint is dependent on the learning rate factor. Because of this, an iterative procedure is used to calculate unit learning curve values. The procedure is as follows:

1. Calculate an initial estimate for B using arithmetic mean values for lot midpoints.

2. Calculate lot midpoints from the above equation using the last estimate for B.

3. Calculate a revised estimate for B using new midpoints.

4. Repeat steps 2 and 3 until the values for B agree within a very small error. [Ref 14:III]

Through the use of regression we can now obtain values for slopes and for first unit costs. Table 3 shows how incremental costs relate to quantity produced using an 80% learning curve, given a first unit cost of $100.

27

TABLE 3

INCREMENTAL COSTS AND QUANTITY PRODUCED

Production Lot	Cumulative Quantity	Incremental Costs Total	Per Unit
1	1	$100	$100
2	2	$ 60	$ 60
3	4	$ 96	$ 48
4	8	$153.6	$ 38.4

[Ref. 13:p. 4]

There is little difference in using the Cumulative Average Cost Concept or the Incremental Unit Cost Concept. One advantage of the Incremental Unit Cost Concept is that it can be used to discuss current operating problems with operating personnel in the manufacturing facility. [Ref. 13:p. 3]

There may be argument as to which provides the better representation of improved product production due to learning. Neither, however, is considered to be a preferred method. Measures of the slope of learning curves (using the unit cost concept) are used in this study to reflect price reduction and pricing strategy.

The next section of this chapter will deal with pricing stability and the concept of slack.

C. PRICING STABILITY

This section of Chapter II introduces the concept of organizational slack and hypothesizes a relationship between price stability and slack based on the amount of "slack"

present within the firm. First, a conceptual review of past studies of slack is presented followed by various definitions of slack. Then, a basis for establishing a relationship between slack and pricing stability is addressed. Finally, various methods to measure organizational slack including the method utilized in this thesis are reviewed.

1. **Review of Past Studies**

March and Simon introduced the concept of "organizational slack" in discussing business's ability to react to economic and environmental fluctuations. Specifically, they suggested that slack is one factor affecting the goals of an organization and, as such, directly impacts on intergroup conflicts:

> When resources are plentiful, subordinate claims are not challenged and goal differentiation occurs; when resources become restricted, group interactions become more competitive, conflict increases, and diversification is reduced. [Ref. 16:p. 1]

Although March and Simon dealt with the concept of organizational slack in discussing how organizations discover economies in times of crisis, it was Cyert and March who first proposed slack as a central variable of their behavioral theory of the firm. [Ref. 17:p. 37] Cyert and March defined organizational slack as "payments in excess of those required to maintain coalition." They suggested that slack may be manifested in many forms and that it serves to stabilize levels of aspiration in

organizations and to absorb fluctuations in the environment. [Ref. 17:p. 38] In other words, slack acts as a stabilizer during prosperous times and as an emergency source of resources during bad times.

Following Cyert and March were Williamson and Schiff & Lewin. Their studies treated slack from the "managerial approach." Williamson suggested that managers have positive preferences for staff, salaries and discretionary profit. His primary emphasis was on management controlling the activities of the firm (staff, salary, profit) in order to achieve certain self-seeking objectives. [Ref. 18:p. 241] Williamson also discussed absorbed and unabsorbed slack.

> When the firm's environment is favorable, staff expenditures will be permitted to absorb excessive amounts of slack. Under conditions of adversity, expenditures for managerial superfluities, staff expenditures and management slack expenditures will be reduced. [Ref. 18:p. 252]

Williamson continues by citing the motivational bases which impel management to strive for resources to satisfy personal needs, and implies that, contrary to Cyert and March, slack is not readily recoverable because these motivational factors are active in both good and poor economic times. [Ref. 19:p. 30]

Schiff and Lewin's managerial approach to organizational slack centers around managers strategically using the budget and other financial control systems in ways unintended by top management. These methods included the submission of lower revenue projections than actually

anticipated, use of standard costs that do not incorporate improvements and inclusion of larger than actually necessary staff and marketing expenses which could be reduced at will without having serious impact on the firm's operations. In addition, budgets may be submitted by division managers which are "reworked" until they meet the profit goal expected by top management. [Ref. 19:p. 31] It is in this light that Schiff and Lewin share Williamson's view that slack is consciously bargained for and that management can control the amount of slack to reduce uncertainty and satisfy personal needs.

Litschert and Bonham developed a conceptual model of strategy formulation which suggests that there is an interrelationship between strategy and structure that to a degree depends on the level of organizational slack. They also stated that slack affects the direction of the strategy-structure relationship by influencing the necessary fit between organization structure and the interactive effects of technologies and environments.

> When slack is low there are no excess resources to pay the price of structural design. . . . Necessary fit is tight, and strategy is determined by structure, at least in part. When slack is relatively high, excess resources are available to pay the price of a structural design. [Ref. 20:p. 217]

> In this case, necessary fit may be loose because economic sacrifice is minimized, and strategy is likely to be more contingent on the ideological values of the dominant coalition. [Ref. 20:p. 217]

Dimmick and Murray in studying human resource policy decisions indicated that an organization's size is closely related to organizational slack.

> The fact that slack and size showed a similar pattern of relationship to logistic policies and practice suggest that either size or financial success allows organizations to commit resources to activities which have significant fixed cost. [Ref. 21:p. 617]

Dimmick and Murray further went on to say that the number of people in an organization is a more relevant indicator of size than is revenue when it comes to explaining patterns in logistic policies. [Ref. 21:p. 616]

Bourgeois' study of organizational slack dealt with several opposing views on how slack promotes political behavior within organizations. Cyert and March stated that slack serves to reduce goal conflict while Astley hypothesized that slack was used to promote political behavior within organizations. Bourgeois' study took the various conceptual terms of slack and put them in empirical form and provided a usable definition of slack consistent with the available literature. [Ref. 22:p. 29]

Following Bourgeois, Bourgeois and Singh examined the effects of slack on political behavior and strategic discord within top management. Specifically, they tested the two opposite theories of Astley and Cyert and March utilizing an empirical measure based on financial indicators. They developed three components of slack which could be empirically related to strategy-making behaviors

32

within top management teams. The first component, recoverable slack, proved to reduce political behavior while the other two components, available and potential slack, appeared to increase political behavior. [Ref. 23:p. 42]

Following Bourgeois and Singh, a thorough review of slack was done by Singh. Singh viewed slack as a two component concept instead of a single dimension construct. These two components are absorbed slack and unabsorbed slack. Absorbed slack, similar to recoverable slack, refers to the slack that is generated into an organizational system design and is absorbed as excess cost. Unabsorbed slack constitutes those resources that remain in excess of those already absorbed. [Ref. 17:p. 46] Further study by Singh proposed and tested several hypotheses relating performance, slack and risk taking in strategic decision making. Utilizing theory from Cyert and March that there is a positive relationship between organizational performance and slack, Singh proposed and tested the hypothesis that slack increases with good performance and decreases with poor performance or, in general terms, performance has a positive effect on slack. [Ref. 17:p. 25]

With regard to slack and risk taking, Singh proposed that organizational slack has a positive effect on risk taking in strategic decision making. While greater absorbed slack was found to enhance risk taking, no such correlation was found when dealing with unabsorbed slack. Singh

therefore concluded that better performance leads only to higher levels of absorbed slack and additional risk taking. Unabsorbed slack as we alluded to earlier, does not have the same effect due to the fact that these uncommitted resources do not play the same buffering role when they are "outside the workflow of the organization" unlike absorbed slack/resources which are an integral part of the organizational activities. [Refs. 17:p. 26; 11:p. 6]

Gershenberg showed that by measuring the amount of slack in labor, capital, and management inputs, one might find that internal growth and development are possible without acquiring additional resources. By studying the large amounts of slack available to several Kenyan manufacturing firms, he found that better utilization of already existing resources could lead to increased productivity without expansion. Gershenberg suggested that one solution to excessive slack would be to establish new noncompeting firms; only such complementary enterprises would reduce the amount of slack resources within the economy. [Ref. 11:p. 2]

In short, these past studies seem to support the following general conclusions concerning slack:

1. There is a close correlation between organizational size and organizational slack.

2. There is an empirical measure of organizational slack composed of several financial indicators resulting in three separate dimensions of slack: recoverable, potential and available slack.

3. Slack has been shown to be related to the risk and performance of firms, and slack has been shown to be related to various kinds of strategic and political behavior by management.

2. Definitions of Organizational Slack

The concept of slack has gone through various stages from March and Simon to the analysis done by Bourgeois and

34

Singh. March, well-known as the pioneer, has defined slack in many diverse ways. In 1963 March, along with Cyert, described slack as:

The disparity between the resources available to the organization a..d the payments required to maintain the coalition. [Ref. 22:p. 31]

Child defined slack as:

The margin of surplus which permits an organization's dominant coalition to adopt structural arrangements which accord with their own preferences, even at some extra administrative cost. [Ref. 22:p. 31]

Cohen, March and Olsen defined it as: "The difference between the resources of the organization and the combination of demands made on it." [Ref. 17:p. 44]

In 1978 Dimmick and Murray reported that slack consisted of "those resources which an organization has acquired which are not committed to necessary expenditure. In essence, these are resources which can be used in a discretionary manner." [Ref. 17:p. 44]

March refined his earlier definition and stated:

Since organizations do not always optimize, they accumulate spare resources and unexploited opportunities which then become a buffer against bad times. Although the buffer is not necessarily intended, slack produces performance smoothing, reducing performance during good times and improving it during bad times. [Ref. 17:p. 43]

Finally, Bourgeois offers a more concise definition by paraphrasing James March:

Organizational slack is the cushion of actual or potential resources which allows an organization to adapt successfully to internal pressures for change in policy, as well as to external changes in strategy with respect to the external environment. [Ref. 22:p. 30]

From the definitions cited in this chapter, we can see that slack has many diverse meanings and can be interpreted in numerous ways. The central theme behind the majority of definitions is that slack consists of "excess resources," which allow the firm flexibility in reacting to internal and external demands or opportunities.

3. Functions of Slack

Bourgeois further suggested that slack either "causes" or serves four primary functions:

(1) First slack is considered as an inducement for organizational actors to remain within the system. In other words, how much would an individual sacrifice in monetary terms or in status items to remain with a firm in an economic crisis. [Ref. 22:p. 33]

(2) The second function of slack is a resource for conflict resolution. This function is highlighted in a review by Moch and Pondy who observe that "slack allows choice opportunities to be distributed generally to all participants. With sufficient slack, there will be a solution for every problem." [Ref. 22:p. 34]

(3) The third function of slack is a facilitator of certain types of strategic or creative behavior within the organization. Hambrick and Snow view this excess slack as allowing an organization to be more innovative and interact in the market more boldly. As a facilitator of suboptimal behavior, slack is perceived as allowing one to "satisfice environmental opportunities, as well as to smooth organizational performance in the face of environmental hostility." [Ref. 22:p. 39]

(4) Finally, slack serves as a buffering mechanism in the workflow process. James Thompson explained this function in terms of the need to "buffer the technical technical core" from the variances and discontinuities presented by environmental demands." [Ref. 22:p. 33] In a production sense, this meant to absorb the inconsistencies in the supply delivery schedule and to absorb fluctuations in demands.

4. Relationship Between Organizational Slack and Pricing Stability

There are many factors which affect the stability of prices: inflation, changes in input cost, the size of the production runs, schedule change, program modifications, etc. However, the fourth function of slack, just mentioned above, provides a potential explanation for price stability. [Ref. 12]

As we alluded to earlier, slack involves the notion of "excess," "surplus," or "uncommitted" resources that provide "buffers" or "cushions" or "opportunities." From the definitions presented earlier by Bourgeois dealing with internal and external pressures or Thompson's "buffering of the technical core," pricing stability may be related to slack due to the ability of the firm to absorb changes in production schedules or program modifications which have an influence on price instability. The ability of the firm to absorb these influences may be conditional on slack. [Ref. 12]

Slack is a somewhat amorphous concept. But recent research (Bourgeois, Singh, Bourgeois & Singh; Moses) has outlined the dimensions of slack and identified financial variables to measure it. Briefly, slack comes from several sources:

A. Resources generated from increased profits

B. Resources tied up in excess working capital

C. Resources absorbed in excess working capital

D. Resources tied up in excess plant or productive capacity

E. Resources potentially available from outside the organization due to the capacity to raise capital.

Slack available to the firm from each of these sources can be measured by financial ratios reflecting financial condition. [Ref. 12]

The second objective of this thesis is to investigate the relationship between measures of financial condition reflecting organizational slack and the stability of prices charged by contractors for major weapon systems.

It is possible that the stability of prices observed on a given program is related to measures of financial condition. This assertion rests on two ideas: A) Measures of financial condition reflect the amount of "slack" in an organization, and B) The ability of an organization to absorb variations in its environment and smooth its operations is related to the amount of slack. [Ref. 12]

Next we will look at measurement of slack.

5. **Measurement of Slack**

Review of past literature shows that slack has a wide range of definitions and is conceptualized in many different ways. The majority of researchers agree that slack consists of "excess" or uncommitted resources but no one has determined specifically how we should quantitatively measure slack.

There have been various methods used throughout the years to measure organizational slack. A popular method has been that of Odell who utilized questionnaires to derive a perceptual measure of slack based on perceived differences between a firm's inducements and contributions. Later, Kmetz used three sets of questionnaires to measure slack resources, slack performance, and production smoothing. Finally, Gershenberg utilized surveys to estimate the amount of labor, capital, and management slack and asked if the uses of resources would change if the current level of demand were increased by some amount.

38

If not, that maximum percentage level was considered to be the amount of available slack. [Ref. 16:p. 13]

These surveys rely on the firms to supply the data; consequently their subjectivity and susceptibility to misinterpretation cannot be avoided. A consistent, quantitative measure of slack that can be used for comparative empirical examination cannot be derived from these qualitative methods. [Ref. 16:p. 13]

Surveys and questionnaires do not measure slack in the quantitative form that is needed in order for it to be an effective management tool. This problem was tackled by Bourgeois and Singh and their approach will be the basis for measurement in this thesis.

In 1981, Bourgeois utilized public financial records to develop slack measures that would enable the researchers to distinguish between "slack gainers" and "slack losers." Bourgeois introduced the above terms in a relative sense rather than in absolute terms. His emphasis was to look at financial statistics over a period of time with the objective being to look at trends and not just a snapshot of one day of the year. [Ref. 22:p. 37]

Bourgeois introduced two sources of slack: internal, or that created by managerial action, and external, or that made available by the environment. [Ref. 22:p. 37] Bourgeois and Singh further developed this model by conceptualizing three categories of slack which rest on

the idea of ease of recovery: available, recoverable and potential slack.

(1) Available slack consists of resources not yet assimilated into the technical design of the organization. It can be measured by an:

increase in: net profit - dividends/sales

increase in: (cash & marketable securities-current liabilities)/sales

decrease in: dividends/net worth

(2) Recoverable slack consists of resources that have been absorbed into the system as excess but may be recovered. It can be measured by:

increase in: accounts receivable/sales

increase in: inventory/sales

increase in: general & admin exp/sales

(3) The last category, potential slack is defined as the capacity of an organization to generate extra resources from the environment. Potential slack can be measured by a:

decrease in: long term debt/net worth or an increase in: price earnings ratio. [Ref. 23:p. 43]

These measures are relative measures of slack in two senses: in addition to measuring change from the prior year, they incorporate a control for any changes in the measurement due to increases or decreases in the overall activity. [Ref. 23:p. 44]

The approach of Bourgeois and Singh and Bourgeois will be the approach used to measure slack in this thesis.

6. Summary

We examined several definitions of slack. The consensus in this section was that slack consists of

"excess" or "surplus" available to a firm. Bourgeois (1981) offers the most concise definition:

> Organizational slack is the cushion of actual or potential resources which allows an organization to adopt successfully to internal pressures for changes in policy, as well as to internal changes in strategy with respect to the external environment. [Ref. 22:p. 7]

The relationship between slack and pricing stability was also examined. It is possible that the stability of prices observed on a given program is related to measures of financial condition. That assertion is the basis for the second portion of this thesis and rests on the premise that:

A) measures of financial condition reflect the amount of slack in an organization, and

B) the ability of an organization to absorb variations in its environment and "smooth" operations is related to the amount of slack present.

Finally, we examined various forms of the measurement of slack ranging from questionnaires to the utilization of public financial records. We introduced a 3-dimensional categorization of slack offered by Bourgeois and Singh and listed particular specific measures within each category. The individual measures of slack were similar to commonly used measures of financial condition.

D. HYPOTHESES

Considering the foregoing discussions of relevant theory, we hypothesize the following:

1. That a quantifiable relationship exists between a company's financial condition and its pricing

strategy, as reflected in the slope of a company's price reduction curve.

2. That a quantifiable relationship exists between a company's financial condition and the stability of prices experienced over the life of a program.

The next chapter will discuss how the necessary data were obtained for use in this study.

III. SAMPLE SELECTION AND DATA COLLECTION

This chapter will describe the following:

1. The process used to select aircraft and missile programs for the sample.

2. The data items from specific programs required for the statistical analysis.

3. The various financial measures acquired, their sources, and their availability.

A. SELECTION PROCESS

Aircraft and missile programs used in this study were based on the availability of the following information:

1. Slope of the unit cost curve for the airframe.

2. R-squared of the unit cost curve for the airframe.

We decided to use the data associated with airframe costs instead of total flyaway costs on the assumption that the airframe is produced totally by the prime contractor. Avionics, engines, armament, test equipment, etc., are frequently supplied either by the government or by various subcontractors.

We found the necessary slopes and R-squared data in two sources. These were the U.S. Military Aircraft Cost Handbook [Ref. 14] and the U.S. Military Missile Cost Handbook [Ref. 15]. These sources provided the following necessary information:

1. Aircraft and missile identification

2. Manufacturer identification

3. Service branch purchaser of each system

4. Various detailed and summary cost data. [Refs. 14,15]

In short, these two handbooks provided the bases for our data collection efforts. These two handbooks were not complete in the data presented. Many of the systems listed had little or none of the data that we required. Therefore, we restricted our sample to the programs which had all of the aforementioned data available. In addition, we only used data for publicly-held companies, as we encountered difficulties in obtaining financial data from privately-held companies.

Table 4 presents the firms, programs, and the years of the programs' lives. It includes seventeen different contractors and a total of fifty-two programs.

Financial data for the companies listed were obtained from their annual reports as published in Moody's Industrials. We extracted elements from these reports as shown in Table 5. This information was collected for the year of each program start, and for each of the five years preceding each program start.

We did encounter some minor problems in obtaining all the necessary data. In some cases, Cash and Marketable Securities were listed as a single account. In these cases, we listed the total figure as cash in our data base. We

TABLE 4

LIST OF CONTRACTORS AND PROGRAMS

Manufacturer	Program	Year Started	Year Ended
Chance-Vought	A-7A/B	65	67
	A-7D	68	75
	A-7E	67	79
	F-8A/B/C	55	58
	F-8D/E	58	63
Motorola	AIM-9C	61	67
Bell	AH-1S	75	80
	AH-1T	76	78
Bendix	RIM-8E	61	66
North American	F-1b/CMT-1	52	55
	F-100C	53	55
	F-100C	54	56
	F-86D	51	53
	F-86F	51	53
McDonnell Douglas	F-15A	73	79
	A-4M	70	77
Douglas	F-6A	52	54
	A-3A/B	53	57
	B-66B	53	55
	A-1E/G/H	52	54
Northrop	F-89D	51	54
Lockheed	P-3A	60	64
	P-3B	65	67
	P-3C	68	82
	F-104A/B/C/D	56	57
Fairchild	A-10A	75	82
Cessna	A-37B	67	73
Boeing	B-47B/E	49	53
	B-52G	57	59
Grumman	A-6A	61	69
	F-14A	71	82

TABLE 4 (CONTINUED)

	A-6E	70	79
Republic	F-84F	51	53
	F-105B/D	57	62
Martin	B-57B/C/E	52	55
Raytheon	AIM-7F	68	80
	AIM-7M	80	82
General Dynamics	RIM-2E	61	66
	RIM-66E	80	82
	RIM-20	61	64
	BGM-109	80	82
	FIM-92A	78	81
	RIM-67B	73	82
	RIM-66B	71	80
	RIM-67A	66	74
	RIM-66A	66	70
	F-102A	53	57
	F-106A/B	57	59
	F-16A	78	82
	FB-111A	67	69
	F-111F	70	74
	RIM-24B	61	66

TABLE 5

FINANCIAL DATA USED IN THE ANALYSIS

Balance Sheet

cash

accounts receivable

marketable securities

inventories

current assets

plant and property assets

total non-current assets

total assets

current liabilities

non-current liabilities

total liabilities

paid in capital

retained earnings

common stock

preferred stock

total stockholder equity

Income Statement

sales

cost of goods sold

operating income

depreciation expense (net)

interest expense

taxes

net income

common dividends

preferred dividends

Miscellaneous

investment in new plant and equipment

earnings per common share

mean common stock price

then gave Marketable Securities a 0 value in the data base. This should not make any difference in our analysis as we did not use any financial ratio that had Marketable Securities as a single element.

In a small number of cases, certain financial data were not published for a given year. We found that it was not unusual to find extremely detailed financial reporting for one year and then only a bare minimum of information available for the next year. In a few cases, we calculated additional needed data from the minimal amount at hand.

Finally, there was a minor problem with mergers. The most difficult problem was with the McDonnell Douglas Corporation. We decided to drop several programs from our sample because of the unclear data presented in certain financial reports. It was not always possible to get the needed six years of financial data for a program, given that a company had recently been established or merged with another. In these cases, we found it better to leave programs associated with such problems out of the sample.

Overall, we feel we have a reasonably accurate and complete data base. It totals 9,464 individual pieces of data.

All necessary measures of financial condition and organizational slack outlined in Chapter II can be calculated from the data items collected and described in this chapter. The next two chapters present our analysis.

Chapter IV addresses the association between pricing strategy (as measured by the slope of price reduction curves) and measures or financial condition. Chapter V addresses the association between pricing stability (as measured by the "fit" of R-squared of pricing curves) and measures of organizational slack.

IV. DATA ANALYSIS: FINANCIAL CONDITION AND THE PRICE REDUCTION CURVE

A. INTRODUCTION

The purpose of this analysis was to determine if stable, significant relationships exist between financial condition and the slopes of price reduction curves. The years of the research were represented by the numbers 0 through 5 with 0 representing the year when the first delivery occurred. The years 1-5 represent the number of years prior to initial delivery.

Several tests were performed to detect any stable, significant relationships. These were:

1. Correlation analyses were performed on individual ratios for each of the years in question (years 5-0).

2. Regression analyses were performed on the financial ratios for year 3. The first action taken was to perform a stepwise regression. Then several other regression models were created by observing the correlation data and heuristically choosing inputs for the models.

3. Regression analyses were again performed in order to analyze yearly change in financial ratios. This consisted of the following four parts:

   a. Manipulation of the data to measure change over time.

   b. Correlation analyses of the periods of change.

   c. Stepwise regression of the new ratios for years 3-2, followed by several linear regression models with inputs chosen heuristically by observing the correlation data.

50

d. Stepwise regression of the new ratios for the years 2-1, followed by several other linear regression models chosen heuristically by observing the correlation data.

B. CORRELATION ANALYSIS

Correlation analyses were performed between the financial ratios and the slopes of the price reduction curves. This was done for each of the years included in this research. The objectives here were as follows:

1. To determine the signs of the relationships between the ratios and the slopes of the price curves.

2. To check the statistical significance of these relationships.

3. To observe consistency and/or trends in relationships over time.

The results of the correlation analyses are presented in Table 6.

C. OBSERVATIONS OF SIGNS

The first important observation was that the signs of the correlation coefficients did not always match the predicted (hypothesized) signs. The hypothesized signs were selected based on Moses' earlier work [Ref. 7]. For the 18 available ratios, the actual results are listed below.

Year 5	5 signs as predicted
Year 4	8 signs as predicted
Year 3	6 signs as predicted
Year 2	7 signs as predicted
Year 1	11 signs as predicted
Year 0	11 signs as predicted

TABLE 6

CORRELATION RESULTS

Category/ Ratio	Predicted Sign	Correlation Coefficients					
		Yr 5	Yr 4	Yr 3	Yr 2	Yr 1	Yr 0
Profitability/							
1. Profit Margin	−	.11	−.01	−.31*	−.08	−.14	−.19
2. Return on Assets	−	.12	.03	−.22*	−.08	−.09	.04
3. Return on Equity	−	.20	.10	−.09	.02	−.02	.12
Shorter Liquidity/							
4. Current Ratio	+	−.27*	−.27*	−.37*	−.36*	.05	.08
5. Quick Ratio	+	−.26*	−.44*	−.43*	−.40*	.01	.01
6. Current Asset Ratio	+	−.24*	−.22	−.21	−.25*	−.27*	−.01
7. Receivables Turnover	+	−.03	−.01	−.12	−.12	−.24	−.02
Solvency/							
8. Debt Ratio	−	.23*	.19	.39*	.45*	.10	.01
9. Non-current Debt Ratio	−	.12	.18	.28*	.30*	−.16	−.10
10. Non-current Debt Ratio	−	.27*	.21	.25*	.33*	.39*	.12
11. Interest Coverage	+	−.12	.06	−.10	−.25*	−.39*	−.26*

TABLE 6 (CONTINUED)

Asset Utilization/

12. Total Asset Turnover	-	-.01	.18	.18	.04	-.19	-.06
13. Plant Asset Turnover	-	-.06	-.03	-.06	-.09	-.19	-.18
14. Inventory Turnover	-	-.02	-.03	.91	.09	-.26*	-.30

Capital Investment/

15. Investment to Assets	+	.33	.14	.05	.05	-.04	.01
16. Investment to Plant	+	-.14	.06	-.05	.01	-.16	-.07
17. Investment to Sales	+	-.42	.06	-.01	.05	.01	-.06
18. Investment to Funds	+	.60*	.04	.06	.02	.08	.21

*Indicates significant at the .10 alpha level ($\leq$ .10)

There were certain trends noted in the correlation data. First, the predicted signs and the actual signs of the correlation coefficients tended to match more frequently as time before project start decreased. This was particularly true of ratios in the following categories:

1. Profitability--the signs tended to match after year 4.

2. Asset Utilization--the signs tended to match throughout the six year period.

3. Capital Investment--the ratios "Investments to Assets" and "Investments to Funds" tended to match throughout the six year period.

D. STATISTICAL SIGNIFICANCE

Most of the univariate correlations were insignificant at the .10 alpha level. This indicates that there was $\leq$ 10 percent probability that such a correlation would occur by chance. The ones that were consistently significant over time were:

Ratio	Years of Significance
Current ratio	5,4,3,2
Quick ratio	5,4,3,2
Non-current debt ratio	5,3,2
Interest coverage	2,1,0
Inventory turnover	1,0

The following is a list of the ratios that had statistically significant coefficients in both year 3 and in year 2.

54

Ratio	Pred. Sign	Corr. Coeffs. yr. 3	yr. 2	Significance yr. 3	yr. 2
Current ratio	+	-.37	-.36	.01	.01
Quick ratio	+	-.43	-.40	.01	.01
Debt ratio	-	.39	.45	.01	.01
Curr. debt ratio	-	.28	.30	.04	.03
Non-curr. debt ratio	-	.25	.33	.07	.07

In none of the above cases did the predicted signs match the actual result of the correlation analysis. There were individual cases, however, where the predicted signs of the correlation coefficients did match the actual results, and where these coefficients were statistically significant. In year 3, the following had both matching signs and statistical significance:

Ratio	Pred. Sign.	Corr. Coeff.	Sign.
Profit margin	-	-.31	.02
Return on assets	-	-.22	.10

Year 3 was the only period for which the correlation coefficients of the profitability ratios were significant at the .10 alpha level. This could indicate that a quantifiable relationship exists between profitability and the slope of the price reduction curve about three years prior to initial product delivery.

There were also year to year differences in the statistical significance of the correlation coefficients.

55

The greatest number of statistically significant coefficients were found in years 3 and 2. In each of these years, seven coefficients had significance levels (alpha levels) of .10 or less. This could indicate that data from these years would be the best to include in a model for predicting the slopes of price reduction curves.

In general, however, the univariate tests proved inconclusive. The magnitude of the correlation coefficients was usually quite small. All too often, the level of significance exceeded the acceptable boundary of .1. Moses suggests that "univariate tests may be inappropriate and that controlling for the inherent interrelationships between individual ratios with a multivariate design may be helpful." [Ref. 7:p. 12] The results of these correlation analyses tended to support that finding.

E. REGRESSION ANALYSIS

Although the shortcomings of the univariate correlation analysis were recognized, the research continued to the regression stage. The objective of the regression analysis was to examine various variables for their potential as predictors of the slopes of the price reduction curves. The steps taken here were to perform a forward stepwise regression, and then to perform several linear regressions in an iterative and heuristic manner.

First, we performed a stepwise regression using all 18 variables. The stepwise regression selected variables

statistically on the basis of incremental explanatory power. Variables were chosen without regard for category (the five dimensions of financial condition outlined in Chapter II) or predicted sign.

Next, we performed several different linear regressions. Here, we used a judgmental approach, taking into account the hypothesized signs for the independent variables. In addition, we attempted to minimize the use of more than one ratio from each category.

The regressions were performed with data from year 3. The reason that year 3 data were selected was that informal discussion with officials at the Naval Air Systems Command indicated that production of an aircraft or missile generally commences about three years after the signing of a contract.

F. STEPWISE REGRESSION

The stepwise regression was used to determine what variables might be most important in building a predictive model. The following ratios are presented with partial and cumulative model R-squared values, predicted signs, and regression coefficients.

Year 3 Ratios	Marginal R^2	Cum. R^2	Std. Error	Regr. Coeff.
Return on assets	.1597	.1597	.51	-1.55
Investment to funds	.0688	.2285	.0004	-.0008
Total assets turnover	.0751	.3037	.02	.06
Receivables turnover	.0409	.3445	.02	-.03

No other variables were included in this model, as these were the only ones that met .15 significance level required by the software in use. The predicted and actual signs of the coefficients for the independent variables matched for rate of return and investment to funds. The signs did not match for total assets turnover and receivables turnover.

Although the results of the stepwise regression were not particularly strong, the regression model does explain a larger percentage of the variance in price reduction slope than does any individual ratio. The R-squared value for the four ratio model was 34.5 percent.

In addition to the stepwise regression, several linear regression models were created by observing the correlation results and heuristically selecting ratios for inclusion in the model. Three factors influenced the construction of the model. These were:

1. A model should be constructed with the minimum number of ratios possible.

2. There should be low collinearity across the set of ratios in the model.

3. There should be only one measure of each construct in the model. In general, this means that only one ratio from each category could be used. In a few cases, however, ratios from the same category did not represent the same construct. Pairwise correlations between the ratios were examined. If the pairwise correlation coefficient was not greater than .40, then we felt it was appropriate to include both ratios in a given model.

Many different models were attempted. Two statistical criteria were used to evaluate the models. These were:

1. F-value and its level of significance.

2. Adjusted R-squared.

The best of the models examined was:

$$slope = .94 - 1.55X(1) - .0008X(2) + .06X(3) - .03X(4)$$
$$\qquad\quad (.08)\quad (.85)\qquad (.0007)\qquad (.03)\qquad (.04)$$

where:

$X(1)$ = Return on assets 3

$X(2)$ = Receivables turnover 3

$X(3)$ = Total assets turnover 3

$X(4)$ = Interest to funds 3

Standard errors in parentheses.

The relevant statistical values for this model were:

F-value = 3.40

alpha (F) = .0737

adjusted R-squared = .3445.

The signs of the coefficients and their predicted signs are presented below.

Ratio	Actual Sign	Pred. Sign
Return on assets	-	-
Receivables turnover	+	-
Total assets turnover	-	+
Investment to funds	+	-

Only one ratio, return on assets, had the predicted sign. This could suggest that there exists an inverse relationship between price reduction curve slope and the three ratios holding signs opposite those predicted. This casts doubt on the arguments presented in Chapter II for expecting particular relationships between financial condition and pricing strategy.

This model includes all of the financial categories except Solvency. This model, however, still has a relatively low R-squared value and a relatively low F-value. For these reasons, another approach was taken in the effort to build a usable model.

G. ANALYSIS OF YEARLY CHANGE

In this part of the research, the data were transformed to construct measures of the year to year change in the financial ratios. The following construct was used to reflect change over time.

$$\text{Change (from time T-1 to time T)} = \log\left[\frac{\text{financial ratio (at time T)}}{\text{financial ratio (at time T-1)}}\right]$$

Once the data were transformed, the same steps were taken as in the previous analysis. The first step taken was to perform a correlation analysis. The results of this are presented in Table 7.

TABLE 7

CORRELATION RESULTS (CHANGE BETWEEN YEARS)

Measures of Change		Correlation Coefficients				
(Category/Ratio	Pred. Sign	Yrs. 5-4	Yrs. 4-3	Yrs. 3-2	Yrs. 2-1	Yrs. 1-0
Profitability/						
1. Profit Margin	-	.05	-.24	.06	-.15	.15
2. Return on Assets	-	.11	-.22	.02	-.07	.03
3. Return on Equity	-	.11	-.22	.04	-.16	-.02
Short Term Liquidity/						
4. Current Ratio	+	-.02	-.14	.01	.54*	.07
5. Quick Ratio	+	-.11	-.10	.02	.33*	-.09
6. Cur. Asset Ratio	+	-.08	-.12	-.11	-.06	-.03
7. Receiv. Turnover	+	.21	-.10	-.03	-.07	.18
Solvency/						
8. Debt Ratio	-	-.09	.21	.01	-.50*	.01
9. Cur. Debt Ratio	-	.01	.16	-.03	-.53*	-.06
10. DON Current Debt Ratio	-	.03	.10	.02	.20	-.26
11. Int. Coverage	+	.30	-.24	-.05	-.20	.28
Asset Utilization/						
12. Total Asset Turnover	-	.03	.01	-.15	-.06	-.10
13. Plant Asset Turnover	-	.09	.05	-.13	-.01	-.12
14. Inv. Turnover	-	-.08	.06	-.07	-.06	-.20
Capital Investment/						
15. Inv. to Assets	+	.40	-.35*	.07	-.02	.03
16. Inv. to Plant	+	.30	-.34*	.07	-.02	.01
17. Inv. to Sales	+	.52	-.34*	.13	.05	-.01
18. Inv. to Funds	+	.17	-.21	.03	-.07	.02

*indicates significant at the .10 alpha level.

H. CORRELATION ANALYSIS

We again observed that there were disparities between predicted and actual signs of the correlation coefficients. For the 18 measures of change, the actual results were as follows:

Year 5-4	7 signs as predicted
Year 4-3	3 signs as predicted
Year 3-2	10 signs as predicted
Year 2-1	11 signs as predicted
Year 1-0	11 signs as predicted

Again, we recognized that the predicted signs and the actual signs of the correlation coefficients tended to match more frequently as time before initial product delivery decreased. This was particularly true of the measures of change in the asset utilization category. In this case, the signs (predicted and actual) matched for the last three time periods prior to initial delivery.

Again, most of the univariate correlations were insignificant at the .10 alpha level. There were no trends observed for the levels of significance for each of the correlation coefficients.

We decided to focus on years 3-2 in further developing this analysis. We did this because these measures of change included the year 3 data used in our earlier regression analyses.

The results for years 3-2 are mixed. While ten of the correlation coefficients had signs that matched the hypothesized signs, none of them had a level of significance that matched the requirements for this research.

I. REGRESSION ANALYSIS

A stepwise regression was attempted using the data for years 3-2 to see if a multivariate approach would exhibit improved associations. No results were realized through this stepwise regression as the insignificance of the coefficients prevented the building of even a single variable model.

In light of this development, we considered an alternative time frame. The data for years 2-1 were chosen because several ratios appeared to be significant in the correlation test. The current ratio, quick ratio, debt ratio and the current debt ratio all met the significance level requirement of .10. In addition, each of these had signs matching the predicted ones.

A stepwise regression was performed and resulted in the following model:

$$\text{slope} = \underset{(.02)}{.906} + \underset{(.13)}{.597X(1)} - \underset{(.06)}{.143X(2)}$$

where:

adjusted R-squared = .41

F-value = 5.66

alpha (F) = .0275

X(1) = current ratio

X(2) = quick ratio

Standard errors in parentheses.

This model showed a definite improvement in R-squared and F values. However, it is important to note that the current ratio and the quick ratio are virtually the same construct. Only one aspect of financial condition is captured in this model. That is short term liquidity. In addition, the two variables enter the model with opposite signs. In this respect, the model is probably not very useful.

This stepwise regression was followed with several linear regression models. Several different models were constructed using three or four of the most promising ratios. We performed these regressions in an attempt to develop a model that would capture several aspects of financial condition.

We chose the ratios used in the regression equations on the basis of:

1. Relatively high correlation with slope

2. Signs as predicted

3. Relatively low correlation with other predictor ratios.

The models examined included the following ratios:

Return on equity

Current ratio or Quick ratio

Debt ratio or Current debt ratio

Investment to sales.

The best of the models attempted is presented here.

$$\text{Slope} = \begin{array}{cccc} .899 & - .012X(1) & - .045X(2) & - .435X(3) \\ (.02) & (.03) & (.08) & (.12) \end{array}$$

where:

X(1) = return on assets

X(2) = quick ratio

X(3) = current debt ratio

Standard errors in parentheses

and the statistical results were:

adjusted R-squared = .33

F-value = 7.62

alpha (F) = .0004.

Two of the three independent variables did have coefficients that matched signs with the predicted ones. The coefficients for return on assets and current debt ratio matched the predicted signs, whereas the coefficient for quick ratio did not.

65

The results of these regressions were disappointing in that the maximum adjusted R-squared achieved was .33. This showed that the transformation of data and the measuring of change over time probably do not aid in the development of a model for predicting price reduction curves.

J. SUMMARY

We attempted to develop a regression model that would serve as a relatively reliable predictor for finding the slopes of price reduction curves. We relied on univariate correlation analysis, stepwise regression and the heuristic selection of independent variables to develop a series of potential models. In addition, we transformed the data set in order to measure change from year to year.

We did find that the ratios representing financial condition tend to correlate more frequently with price reduction curve slope as the time to initial delivery decreases. We also found that a significant amount of the variation in price reduction curves could be explained through the use of our better models.

The research did not provide a reliable predictive model. The research did not strongly reinforce earlier findings that a definite relationship exists between financial condition and the slope of the price reduction curve. While there was occasional evidence of significant relationships between financial ratios and price reduction slopes, those relationships were not consistently

significant over time.   Further research is required, however, to develop a model to reliably predict the slope of the price reduction curve.

V. ANALYSIS OF ORGANIZATIONAL SLACK AND PRICING STABILITY

A. INTRODUCTION

This chapter describes the statistical analysis conducted and results of that analysis concerning the relationship between organizational slack and the stability of prices charged by contractors.

Based on the Bourgeois and Singh measurement framework described in Chapt II, 12 measures of organizational slack were determined for each contracting firm for the six year period prior to and including and year of delivery of the first weapon system unit by the contractor. The measures nd their presumed association with slack are in Table 8. The R-squared of learning curves fit to prices charged over the delivery period of each weapon system was used as a measure of the stability of prices. Higher R-squared implies a better fit of the learning curve to actual prices and therefore a smoother or more stable price series. The objective of the statistical analysis was to test for associations between the slack measures and the R-squared of the price curve. Correlation analysis was used. A comment on notation is necessary: year 0 is the year in which delivery of the first unit occurred. Year 1 is one year prior to delivery. Year 2 is two years prior, etc.

TABLE 8

SLACK MEASURES

SYMBOL	CALCULATION	ASSUMED ASSOCIATION WITH SLACK
Available Slack		
PRO	(Net Income-Dividends)/Sales	+
QUI	(Cash + Marketable Securities - Current Liabilities)/Sales	+
QUU	Dividends/Net Worth	-
Recoverable Slack		
WKC	(Current Assets - Current Liabilities)/Sales	+
ACC	All Receivables/Sales	+
INIT	Inventory/Sales	+
GEN	(Sales - Cols - Operating Income)/Sales	+
NCA	Non-Current Assets/Sales	+
Potential Slack		
CUR	Current Liabilities/Stock Equity	-
LTD	Long Term Liabilities/Stock Equity	-
TOT	Total Liabilities/Stock Equity	-
INTC	(Net Income + Interest Expense)/Interest Expense	+
PER	Stock Price/Earnings Per Share	+

B. PRESENTATION OF ANALYSIS

The analysis was conducted in four parts.

(1) Correlations between R-squared and individual slack variables measured at each year (5-0) of the test period.

(2) Correlations between R-squared and average level of slack measured over multiple years.

(3) Correlations between R-squared and the year-to-year change in slack measured between successive years of the test period.

(4) Correlations between R-squared and cumulative change in slack measured over multiple years.

In observing the results three issues were of concern:

(1) Hypothesized Signs: Was the direction of the associations between slack and price stability (R-squared) as hypothesized?

(2) Significance: Were the correlations statistically significant? (We adopted an alpha level of $\leq$ .10 as a threshold for significance.)

(3) Consistency: Were the findings for variables measured at different points consistent across the six year test period?

1. Level of Slack/Individual Years

First correlations between R-squared and the individual slack variables were computed for the period 5-0. The objective here was to determine if the amount of slack in years prior to system delivery was associated with price stability.

Results are in Table 9. Several broad conclusions are evident from the table. First, only one correlation is significant, so no strong association between slack and price stability is evident from these tests. Second, the

70

TABLE 9

LEVEL OF SLACK/INDIVIDUAL YEARS

Ratio	Hyp. Sign	Year 5	4	3	2	1	0
PRO	+	-.32	-.16	-.06	-.19	-.02	-.04
QUI	+	+.09	-.08	-.01	+.17	+.13	+.02
QUU	-	-.25	-.20	-.24	-.19	-.18	-.14
WKC	+	-.23	-.22	-.22	-.20	-.22	-.20
ACC	+	-.11	+.05	+.03	-.14	+.10	+.10
INVT	+	+.07	+.19	+.15	+.11	+.10	+.10
GEN	+	+.12	+.02	-.25	+.04	-.02	-.19
NCA	+	-.03	+0.2	-.14	-.24	-.28	-.17
CUR	-	+.11	+.24	+.12	-.08	+.02	+.14
LTD	-	-.03	+.06	-.26*	-.08	+.01	-.02
TOT	-	+.08	+.25	+.05	-.08	+.01	+.12
PER	+	-.08	-.16	-.20	-.01	-.13	+.06

*Indicates correlation is significant, alpha $\leq$ .10

signs of the correlation coefficients are not generally as hypothesized. Less than half of the correlations have the correct sign. Third, there is little consistency in signs across the different years. Only four slack measures (PRO, QUU, WKC and INVT) have consistent signs for all six years. Of those four, only two (QUU, INVT) have the hypothesized sign.

71

2. Average Level of Slack/Multiple Years

Step two consisted of correlations between R-squared and the average level of slack over multiple years. Averages over three different periods were computed:

5-0, 4-1 and 3-1 .

Average slack was computed as follows, utilizing year 5-0 as an example:

Average Slack Level (5-0) = (VAR0+VAR1+VAR2...VAR5/6)

The objective of this averaging process was to smooth out year to year fluctuations in the slack measures to create measures that would reflect the level of slack throughout several years of the test period. These average slack measures were then correlated with price stability (R-squared).

Correlation results for measures averaged over the 4-1 period are in Table 10. (Results for the other two periods were similar and are not reported.) There is small, but noticeable, improvement. Two are significant, each with the predicted sign. The overall findings do not, however, provide particularly strong evidence for a relationship between average level of slack and price stability.

3. Slack Change/Successive Years

Next we computed the year to year change in slack for successive years during the test period. The following log measure was used:

72

TABLE 10

AVERAGE LEVEL OF SLACK/MULTIPLE YEARS 4-1

RATIO	CORRELATION	HYPOTHESIZED SIGN
PRO	+.01	+
QUI	+.29*	+
QUU	-.18	-
WKC	-.01	+
ACC	+.01	+
INVT	-.02	+
GEN	-.19	+
NCA	-.24	+
CUR	-.16	-
LTD	-.24	-
TOT	-.25*	-
INTC	+.08	+
PER	+.09	+

*Indicates correlation is significant at alpha $\leq$ .10

Slack Change = ln(Variable year t/Variable year t-1)

This measure is positive (negative) for increases (decreases) in a variable from one year to the next. The objective here was to determine if increases in slack over time are associated with price stability.

Results are in Table 11. Several broad conclusions are evident from the table. First, only one correlation is

TABLE 11

SLACK CHANGE/SUCCESSIVE YEARS

RATIO	HYP. SIGN	YEARS 5-4	4-3	3-2	2-1	1-0
PRO	+	+.21	+.14	-.10	+.07	+.05
QUI	+	-.05	+.03	+.21	-.13	-.20
QUU	-	+.21	-.21	+.11	+.09	-.02
WKC	+	+.20	+.02	-.14	+.15	+.07
ACC	+	+.23*	-.03	-.19	+.10	+.13
INVT	+	+.01	-.01	-.10	-.14	-.08
GEN	+	+.07	-.27	-.11	+.12	-.11
NCA	-	-.05	-.14	-.19	+.02	+.02
CUR	-	+.21	-.16	-.20	+.05	+.14
LTD	-	-.02	-.18	+.03	-.08	+.21
TOT	-	+.35	-.20	-.16	+.01	+.17
PER	+	-.15	+.24	+.16	+.15	-.08
INT	+	+.22	+.15	+.09	-.04	+.08

*Indicates correlation is significant, alpha $\leq$ .10.

significant which again indicates no strong association between slack and pricing stability. Second, the signs of the correlation coefficients are not as hypothesized. Finally, there is little consistency in signs across the different years for the respective slack measures including ACC, which was the one significant correlation.

4. Cumulative Change in Slack/Multiple Years

The final step was somewhat analogous to step 2. In step 2 we investigated the average level of slack over several years. Here, we investigated the average change in slack, again over multiple year periods. Change in slack for several years was calculated as follows (using the 4-1 period as an example).

$$\text{Cumulative Change in Slack (Variable 4-1)} = \text{Log(Variable]/Variable 4)}$$

Again, the objective was to smooth out year to year variation in slack change with a measure that reflected a cumulative change in slack. Again, these cumulative change measures were correlated with the R-squared of the price reduction slopes. Slack change was accumulated over various multiyear periods. The correlations using measures for the 4-1 period are representative of the results and presented in Table 12. The findings are not strongly supportive of the hypotheses. Only 7 of 13 correlations have the predicted signs. Only one correlation is significant (PER) and it has sign opposite from that predicted.

C. SUMMARY OF RESULTS

In summary, we utilized 13 measures of organizational slack for each contracting firm during the six year period. Our objective was to test if a relationship existed between

TABLE 12

CUMULATIVE SLACK CHANGE/MULTIPLE YEARS 4-1

RATIO	CORRELATION	HYPOTHESIZED SIGN
SLACK		
PRO	-.17	+
QUI	+.05	+
QUU	-.23	-
WKC	-.24	+
ACC	+.03	+
INVT	+.2C	+
GEN	-.01	+
NCA	-.21	+
CUR	+.04	-
LTD	-.03	-
TOT	+.03	-
INTC	+.05	+
PER	-.24*	+

*Indicates correlation is significant at Alpha $\leq$ .10.

the slack measures and the R-squared of the price reduction curve.

The analysis was conducted in four parts. Each of these tests included correlating the R-squared of the price reduction curve and the following:

1. Individual slack variables at each year

2. Average level of slack over the multiple years prior to product introduction

3. The year to year change in slack measured between successive years

4. Cumulative change in slack measured over multiple years prior to product introduction.

Our analysis showed little association between slack and pricing stability in the first test. This was apparent from the lack of significant correlation coefficients, the lack of matched signs between the actual and hypothesized correlation coefficients, and the inconsistency in the actual signs across the different time periods.

The second test was conducted in order to see if the averaging process would "smooth out" year to year fluctuations. There was improvement, but our findings did not provide strong evidence for a relationship between average level of slack and price stability.

Our next step was to see if increases in slack over time could be associated with price stability. Our results showed that they were not. We reached this conclusion based on the lack of significant correlations, the prevalence of incorrect signs, and the inconsistency of signs throughout the test period.

Finally, we measured a cumulative change in slack over multiple years. Our objective was to smooth out the year to year variation in slack change. Our findings were not strongly supportive of the hypotheses.

In conclusion, little apparent association was found between organizational slack and pricing stability.

VI. SUMMARY, LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

A. INTRODUCTION

This chapter will briefly summarize the various aspects of the research involved in this study. Following the summary, we will discuss the limitations of this research, and make recommendations for future research.

B. RESEARCH QUESTIONS

We began this research in order to address the following questions:

1. Does an identifiable relationship exist between financial condition and pricing strategy?

2. Does an identifiable relationship exist between organizational slack (as measured using financial data) and pricing stability?

In order to motivate the analysis, we provided a background discussion of the following:

1. Financial condition and its elements

2. Pricing strategy

3. Organizational slack and pricing stability.

We decided to restrict the sample data in use to the aerospace industry. We did this based on the availability of required financial and project data. We used data from 17 different companies and 52 different aircraft and missile programs. The data were collected for the year of program start and for the five preceding years.

We used the raw financial data to construct financial ratios that describe the different aspects of financial condition. We also used law financial data to construct measures of organizational slack. Slopes and R-squared values of learning curves fit to price data were used as measures of pricing strategy and pricing stability, respectively. We then performed a number of statistical tests in order to determine if the hypothesized relationships exist.

C. PRICING STRATEGY

First, a series of tests were performed to test the relationship between financial condition and pricing strategy. The following is a brief synopsis of the tests performed:

1. Correlation analyses were performed between the various financial ratios and the slopes of the price reduction curves. These were done for all six years studied.

2. Stepwise regressions were performed using slope as the dependent variable and the various financial ratios as the independent variables. This was done for year 3 only.

3. Several different linear regression models were examined. Independent variables were heuristically chosen on the basis of the signs of their related correlation coefficients and the level of significance of those same coefficients. This was only done for year 3.

4. Correlation analyses were performed between the measures of change (year to year) of the financial ratios and the slopes of the price reduction curves. This was done for all the periods of change.

5. Stepwise regressions were performed using slope as the dependent variable and the different measures of change as the independent variables. This was done for the periods of change 3-2 and 2-1.

6. Again, several different linear regression models were constructed. The independent variables were again chosen on the basis of the signs of their correlation coefficients and the level of significant of those same coefficients.

The results of the analysis for financial condition and pricing strategy showed that correlations between financial conditions and the slope of the price reduction curve improved as time to initial product delivery decreased. We also found that a significant amount of the variation in price reduction curves could be explained through the use of linear regression models. The results, however, did not indicate that a consistent identifiable relationship exists between financial condition and pricing strategy.

D. PRICE STABILITY

The tests concerning organizational slack (as measured using financial data) and pricing stability were conducted in four parts. These utilized the 13 measures of organizational slack described in Chapter V. These tests included the following:

1. Correlation analysis between R-squared of the price reduction curve and the individual measures of slack at each year.

2. Correlation between the R-squared of the price reduction curve and the average level of slack over multiple years.

Next, the year to year change in slack was measured between successive years. We then performed the following tests:

3. Correlation analysis between R-squared of the price reduction curve and the measures of year to year change in slack in successive years.

4. Correlation analysis between R-squared of the price reduction curve and the measures of cumulative change in slack over multiple years.

The tests regarding change in slack over multiple years were conducted in order to see if the averaging process would "smooth out" year to year fluctuations in the slack measures.

The results of the analysis for organizational slack and pricing stability showed no strong association between the two. This was confirmed by the lack of hypothesized signs for each period tested. In addition, there were only a few statistically significant ratios. Nearly half the significant ratios had the incorrect hypothesized sign. Finally, there was little consistency in the respective variables' signs across the test period. In conclusion, little apparent association was found between organizational slack and pricing stability.

E. LIMITATIONS AND FUTURE RESEARCH

1. Sample Selection of Issues

The sample population for this research was based solely on one type of contract (aerospace). Perhaps a study utilizing contractors from other areas would provide a

broader perspective and more conclusive results. Specifically, one might look at non-major products within a lower dollar value and shorter production period or possibly other areas of the armed forces (ships, submarines, armored vehicles, etc.).

Data taken for this study were collected over a long period (35 years). Industry conditions vary from year to year. This might make it inappropriate to compare ratios from year to year. Further research may consider limiting the test period to a smaller time period (5-10 years).

2. Measurement of Variables

The financial ratios utilized for representing financial condition and organizational slack were constructed using raw financial measures. Alternative variables reflecting financial condition and organizational slack might be measured relative to industry averages. This might alter the conclusions reached in this study.

Our measures of organizational slack were based strictly on the research of Bourgeois and Singh. This measurement technique has not been fully validated and therefore other means of measurement should be considered. Perhaps the use of questionnaires, as suggested by Odell and Kmetz (Chapter II) or the method suggested by Gershenberg (Chapter II) utilizing surveys, could be employed as a means to measure slack.

Price "stability" was measured using the R-squared of learning curves fit to prices charged over the delivery period of each weapons system. This can be considered a rather crude measure. Future research could consider alternative forms of stability measures such as using the percent change in unit price for each year of the test period.

3. Statistical Tests

It is important to note that we relied entirely on linear correlation and regression methods in the course of our research. It is quite possible that one or both of the relationships examined are non-linear in nature.

In addition, all of the tests used were parametric. This aspect of the testing required strong assumptions concerning the distribution of the variables involved. Non-parametric testing might very well have provided different results.

F. CONCLUSION

In conclusion, our analysis was not able to identify consistent, significant relationships between financial measures and either pricing strategy or price stability. In the test of pricing strategy there was some indication that financial ratios taken from the years immediately prior to product delivery might be associated with pricing strategy, but the findings were only suggestive. In the tests of pricing stability, there was no convincing evidence of any

relationship between organization slack and price stability. It is possible that the relationships we attempted to identify do not exist. It is also possible that consistent relationships do exist but that our methodology failed to identify them. We recommend that future research adopt alternative approaches to investigating the research questions outlined in this study.

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